1. (a) correct end points (A1)(A1)

max = 27, min = 4

range = 23 A1 N3 3

(b) Graph 3 A2 N2 2

[5]

2. (a) 18 A1 N1

(b) (i) 10 A2 N2

(ii) 44 A2 N2

[5]

3. (a) evidence of using $\sum f_i = 100$ (M1)

$k = 4$ A1 N2

(b) (i) evidence of median position (M1)

e.g. 50^{th} item, 26 + 10 + 20 = 56

median = 3 A1 N2

(ii) Q_1 = and $Q_3 = 5$ (A1)(A1)

interquartile range = 4 (accept 1 to 5 or 5–1, *etc*.) A1 N3

[7]

4. (a) median $m = 32$ A1 N1

(b) lower quartile $Q_1 = 22$, upper quartile $Q_3 = 40$ (A1)(A1)

interquartile range = 18 A1 N3

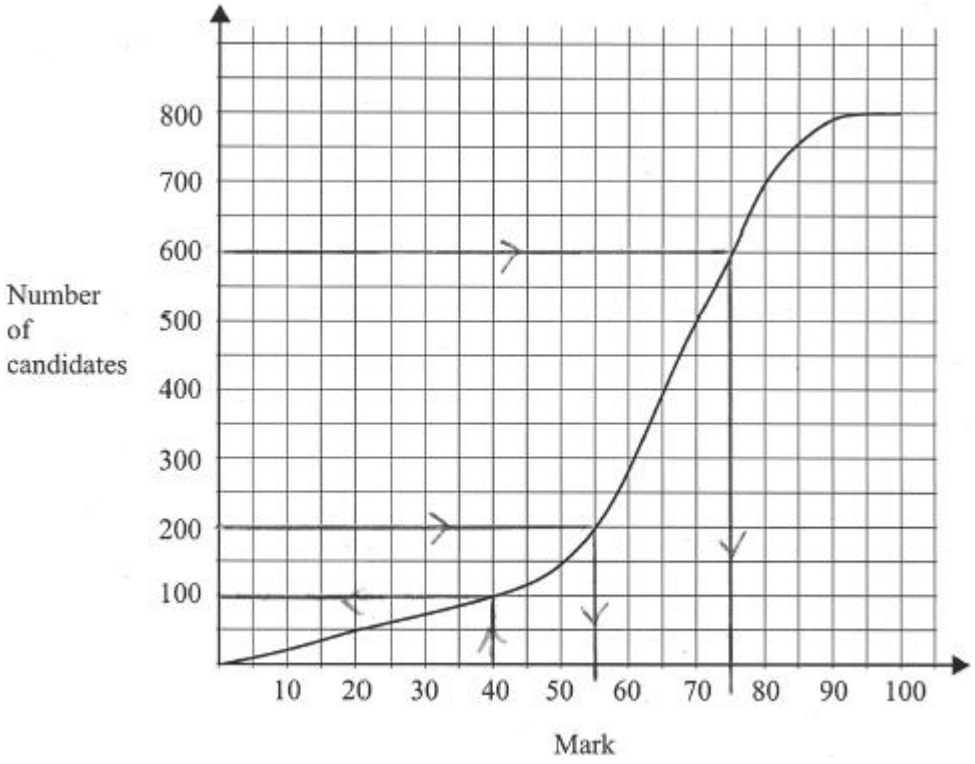
(c)

Time (minutes)	Number of students
$0 \le t < 10$	5
$10 \le t < 20$	**11**
$20 \le t < 30$	20
$30 \le t < 40$	24
$40 \le t < 50$	**14**
$50 \le t < 60$	6

A1A1 N2

[6]

5.



(a) Lines on graph (M1)
100 students score 40 marks or fewer. A1 N2

(b) Identifying 200 **and** 600 A1
Lines on graph (M1)
$a = 55$, $b = 75$ A1A1 N1N1

[6]

6. (a) (i) $m = 165$ A1 N1

(ii) Lower quartile (1^{st} quarter) = 160 (A1)
Upper quartile (3^{rd} quarter) = 170 (A1)
IQR = 10 A1 N3

(b) Recognize the need to use the 40^{th} percentile, or 48^{th} student (M1)
eg a horizontal line through (0, 48)
$a = 163$ A1 N2

[6]

7. $b = 3$, $c = 3$ A1A1 N2

using mean $\left(\frac{a+b+c+d}{4}=4\right)$ M1

using range ($d - a = 6$) M1

$a = 2$, $d = 8$ A1A1 N2

[6]

8. (a) (i) $r = 10$ A2 N2

(ii) $s = 13$ A2 N2

(b) Using $\frac{\sum x}{12}=10$ A1

$t = 18$ A1 N1

[6]

9. (a) D B C A1A1A1 N3

(b) B A C A1A1A1 N3

[6]

10. (a) 3 A1 N1

(b) 6 A2 N2

(c) Recognizing the link between 6 and the upper quartile (M1)
eg 25% scored greater than 6,
0.25×32 (A1)
8 A1 N3

[6]

11. (a) (i) 50 (accept 49, "fewer than 50") A1 N1

(ii) Cumulative frequency (7) = 90 (A1)

$90 - 50$ (M1)

$= 40$ A1 N2

(iii) 75th or 75.5th person A1

median = 6.25 (min), 6 min 15 secs A1 N1

(b) Evidence of finding 40% (60%) of 150 M1

Number spending less than k minutes is $(150 - 60) = 90$ (A1)

$k = 7$ A1 N2

(c) (i)

t (minutes)	$0 \le t < 2$	$2 \le t < 4$	$4 \le t < 6$	$6 \le t < 8$	$8 \le t < 10$	$10 \le t < 12$
Frequency	10	23	**37**	**38**	**27**	15

A1A1A1 N3

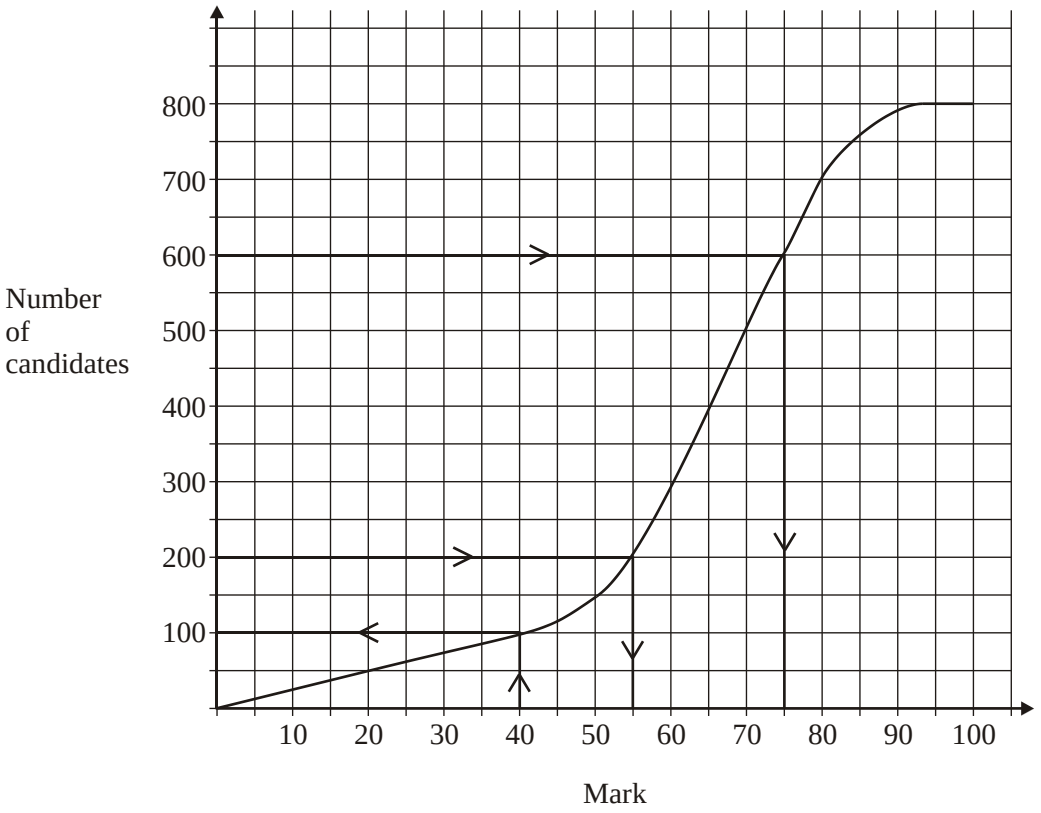
(ii) Evidence of using **all** correct mid-interval values (1, 3, 5, 7, 9, 11) A1

$$\text{mean} = \left(\frac{1\times10+3\times23+5\times37+7\times38+9\times27+11\times15}{150}\right)$$

$= 6.25$ (min), 6 min 15 secs A1 N1

[14]

12.



(a)	Lines on graph	(M1)		
	100 students score 40 marks or fewer.	A1		2
(b)	Identifying 200 and 600	A1		
	Lines on graph.	(M1)		
	$a = 55$, $b = 75$.	A1A1		4

[6]

13. (a) $\text{mean} = \sum \frac{x}{n} \left(= \frac{2230}{45} \right)$ (M1)

$\bar{x} = 49.6$ (Accept 50) (A1) (C2)

(b) $\bar{y} = \frac{\sum y}{n+2}$ (may be implied) (M1)

$\sum y = 2230 + 37 + 30$ (A1)

$\bar{y} = \frac{2297}{47}$ (A1)

$= 48.9$ (Accept 49) (A1) (C4)

[6]

14. (a) 76 (mice) (A1) (N1)

(b) 11.2 (seconds) (A1) (N1)

(c) (i) $p = 76 - (16 + 22) = 38$ (allow **ft** from (ii) (a)) (A1) (N1)

$q = 132 - 76 = 56$ (A1) (N1)

(ii) $x = \frac{7.5\times 16 + \ldots . 14.5\times 23}{16 + \ldots 23} \quad \left(= \frac{3363}{300}\right)$ (M1)

$= 11.2$ (accept 11.21) (A1) (N2)

[6]

15. (a)

Mark (x)	$0 \le x < 20$	$20 \le x < 40$	$40 \le x < 60$	$60 \le x < 80$	$80 \le x < 100$
Number of Students	22	**50**(±1)	**66**(±1)	**42**(±1)	20

(A1)(A1)(A1) (C3)

(b) 40th Percentile $\Rightarrow$ 80th student fails, (mark 42%) (M2)

Pass mark 43% (Accept mark > 42.) (A1) (C3)

[6]

16. List of frequencies with p in the middle

eg 5 + 10, p, 6 + 2 $\Rightarrow$ 15, 8, or $15 < \frac{23+p}{2}$, or $p > 7$. (M1)

Consideration that $p < 10$ because 2 is the mode or discretionary for further processing. (M1)

Possible values of p are 8 and 9 (A2)(A2) (C6)

[6]

17. (a) line(s) on graph (M1)
median is 183 (A1) (C2)

(b) Lower quartile $Q_1 = 175$ (A1)

Upper quartile $Q_3 = 189$ (A1)

IQR is 14
(Accept 189 – 175, 175 to 189, 189 to 175 and 175 – 189) (M1)(A1) (C4)

[6]

18. $d = 11$; $c = 11$ (A1)(A1)(C1)(C1)

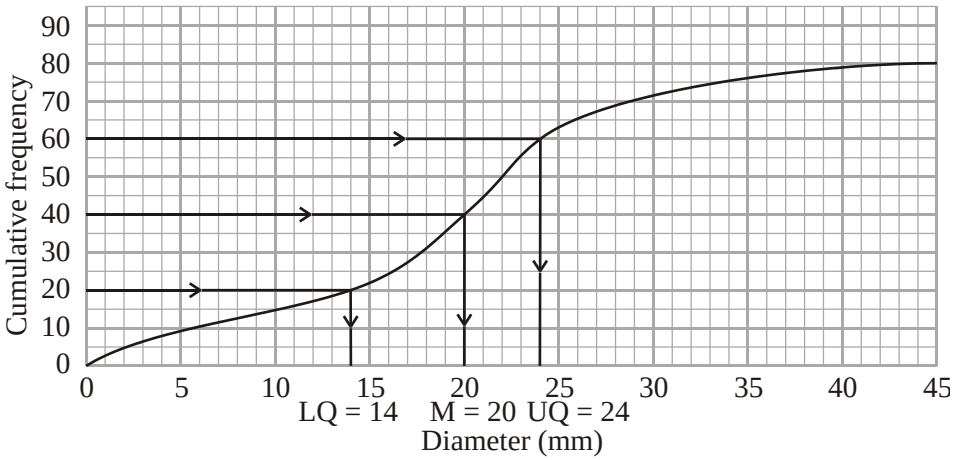
$d - a = 8$ (or $11 - a = 8$) (A1)
$a = 3$ (A1) (C2)

$\frac{3+b+11+11}{4} = 8 \left(\text{or } \frac{\text{sum}}{4} = 8 \right)$ (A1)

$b = 7$ (A1) (C2)

[6]

19.



(a) (i) Correct lines drawn on graph, (A1)(C1)
median = 20 (A1)(C1)

(ii) Correct lines drawn on graph, (A1)(C1)
UQ = Q_3 = 24 (A1)(C1)

(b) IQR = $Q_3 - Q_1$(or UQ – LQ) (M1)
= 10 (accept 14 to 24) (A1) (C2)

Note: *Accept 14 to 24, 24 to 14, 14 – 24 or 24 –14.*

[6]

20. Jan–Sept $\sum = 630 \times 9 = 5670$ (M1)(A1)
Oct–Dec $\sum = 810 \times 3 = 2430$ (M1)(A1)

$$\bar{x} = \frac{5670 + 2430}{12}$$ (M1)

mean = 675 (A1) (C6)

[6]

21. (a) (i) median fare = \$24 (±0.5) (A1)

(ii) fare ≤ \$35 => number of cabs is 154 (or 153) (A1) 2

(b) 40% of cabs = 80 cabs (A1)
fares up to \$22 (A1)
distance = \$22 ÷ \$0.55 (M1)
a = 40 km (A1) 4

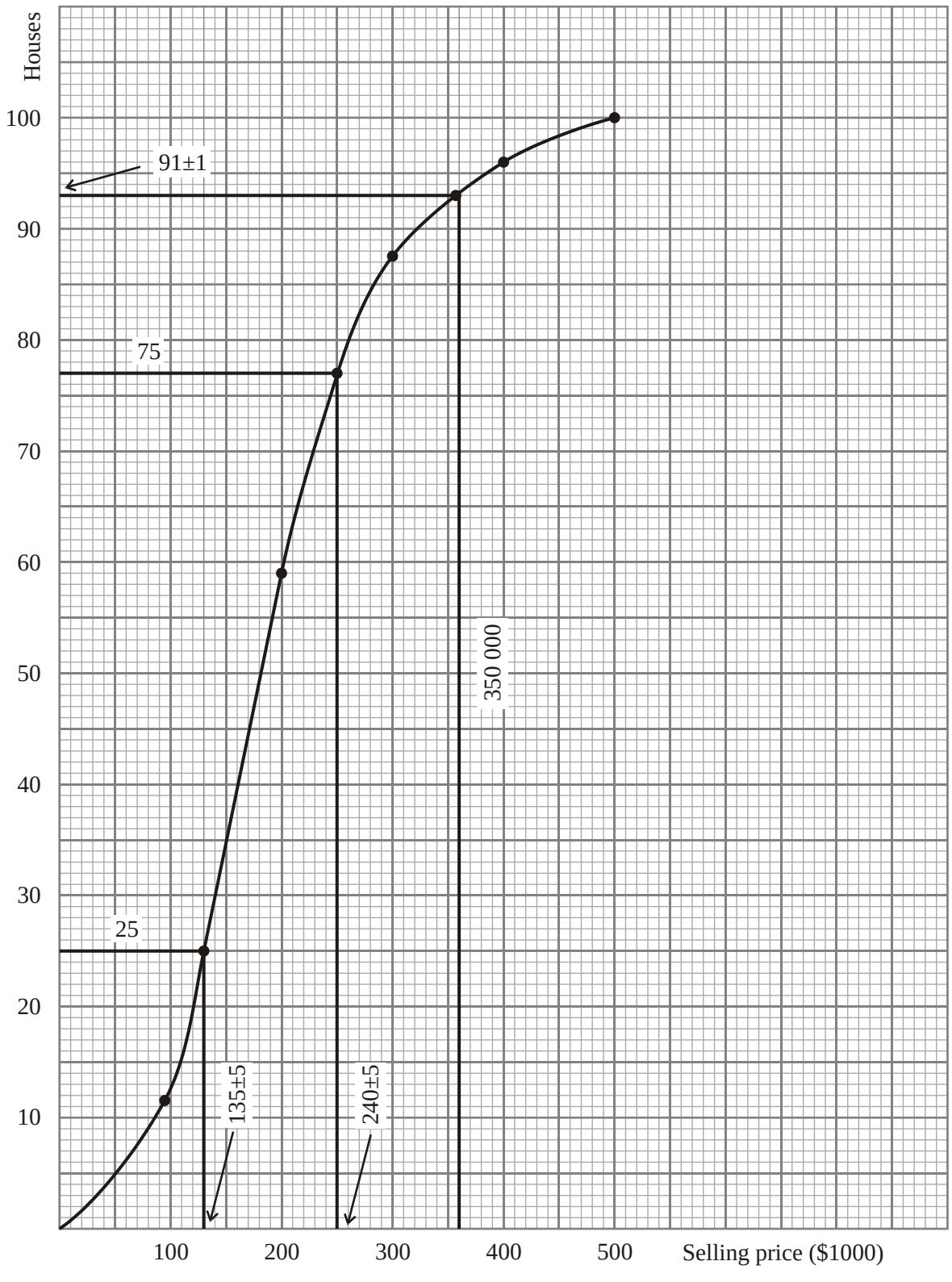
(c) Distance 90 km => fare = 90 × \$0.55
= \$49.50 (A1)
Fare \$49.50 => number of cabs = 200 –186 (M1)
= 14 (A1)
Thus percentage is $\frac{14}{200}$ = 7% (A1) 4

[10]

22. Median = middle value => $b = 11$ (A1)
Mean = $\frac{a+b+c}{3} = \frac{a+11+c}{3}$ = 9 => $a + 11 + c = 27$ (M1)
=> $a + c = 16$ (A1)
Range = $c – a = 10$ (M1)(A1)
Solving equations simultaneously gives $a = 3$ (A1) (C6)

[6]

23. (a)



(A1)(A2)(A1) 4

Notes: *Award (A1) for correct axes, scales and labelling, (A1) for correctly plotted points.*
Award (A2) for good curve correctly drawn, (A1) for badly drawn, correct curve.
Award (A1) for a correct polygon.

(b) $Q_1 = 135 \pm 5$ $Q_3 = 240 \pm 5$ (M1)(A1)

Interquartile range $= 105 \pm 10$. (Accept 135 – 240 or 240 – 135.) (A1) 3

Note: *Award (M1) for the correct lines on the graph.*

(c) $a = 94 - 87 = 7, \quad b = 100 - 94 = 6$ (A1)(A1) 2

(d) mean = $\frac{12(50)+46(150)+29(250)+7(350)+6(450)}{100}$ (M1)

= 199 or \$199000 (A1)

OR

mean = 199 or \$199000 (G2) 2

(e) (i) $350000 => 91.5

Number of *De luxe* houses $\simeq 100 - 91.5$ (M1)

$= 9$ or 8 (A1)

(ii) P (both > 400000) = $\frac{6}{9}\left(\frac{5}{8}\right)=\frac{5}{12}$ or $\frac{6}{8}\left(\frac{5}{7}\right)=\frac{15}{28}$ (M1)(A1) 4

Note: *Award (M1)(A0) for the answers* $\frac{4}{9}$ or $\frac{9}{16}$ *obtained from correct independent probabilities.*

[15]

24. (a) $s = 7.41 (3 \text{ sf})$ (G3) 3

(b)

Weight (W)	$W \leq 85$	$W \leq 90$	$W \leq 95$	$W \leq 100$	$W \leq 105$	$W \leq 110$	$W \leq 115$
Number of packets	5	15	**30**	**56**	**69**	**76**	80

(A1) 1

(c) (i) From the graph, the median is approximately 96.8.
Answer: 97 (nearest gram). (A2)

(ii) From the graph, the upper or third quartile is approximately 101.2.
Answer: 101 (nearest gram). (A2) 4

(d) Sum = 0, since the sum of the deviations from the mean is zero. (A2)

OR

$$\sum (W_i - \overline{W}) = \sum W_i - \left(80 \frac{\sum W_i}{80} \right) = 0 \quad \text{(M1)(A1)} \quad 2$$

(e) Let A be the event: $W > 100$, and B the event: $85 < W \leq 110$

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)} \quad \text{(M1)}$$

$$P(A \cap B) = \frac{20}{80} \quad \text{(A1)}$$

$$P(B) = \frac{71}{80} \quad \text{(A1)}$$

$$P(A \mid B) = 0.282 \quad \text{(A1)}$$

OR

71 packets with weight $85 < W \leq 110$. (M1)
Of these, 20 packets have weight $W > 100$. (M1)
Required probability = $\frac{20}{71}$ (A1)
$= 0.282$ (A1) 4

Notes: *Award (A2) for a correct final answer with no reasoning.*
*Award up to (M2**)** for correct reasoning or method.*

[14]

25. $\frac{(10\times1)+(20\times2)+(30\times5)+(40\times k)+(50\times3)}{k+11} = 34$ (M1)(A1)

$\frac{40k+350}{k+11} = 34$ (A1)

$\Rightarrow k = 4$ (A1) (C4)

[4]

26. (a)

x	15	45	75	105	135	165	195	225
f	5	15	33	21	11	7	5	3

(M1)

$\bar{x}$ = 97.2 (exactly) (A1) 2

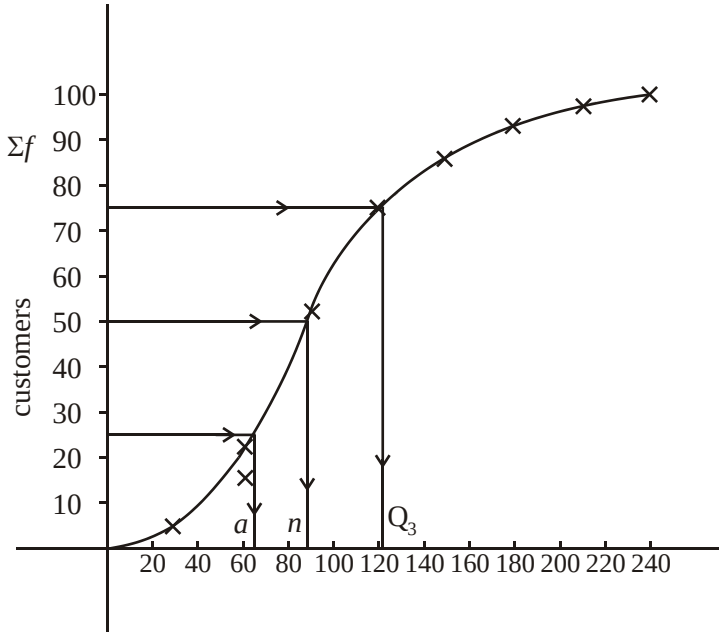
(b)

x	30	60	90	120	150	180	210	240
Σf	5	20	53	74	85	92	97	100

(A1) 1

Note: *Award (A1) for correct values for x, Σf.*

(c)



(A4) 4

Notes: *Award (A2) for 6 or more points correct, (A1) for 4/5 points correct.*
Award (A1) for a reasonable graph, (A1) for the correct axes and the given scales.

(d) Median = 87 ± 2 (A1)

Lower quartile = 65 ± 2 (A1)

Upper quartile = 123 ± 2 (A1) 3

[10]

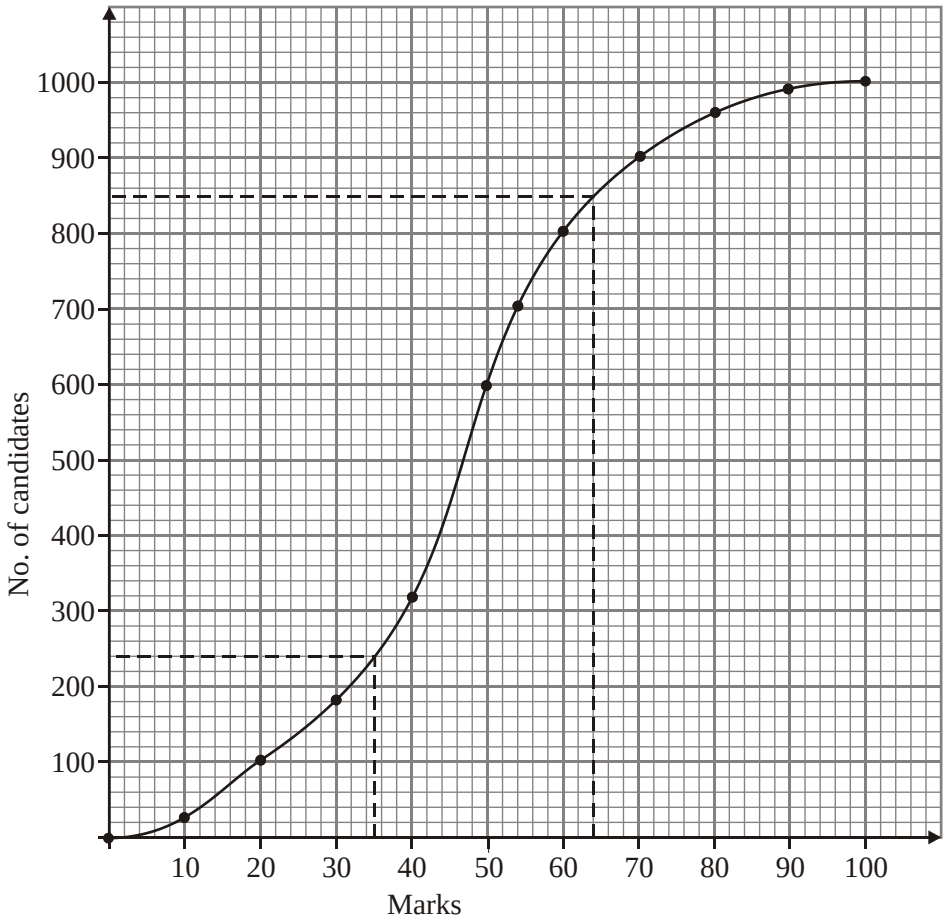
27. (a)

Mark	≤ 10	≤ 20	≤ 30	≤ 40	≤ 50	≤ 60	≤ 70	≤ 80	≤ 90	≤ 100
No. of Candidates	15	65	**165**	335	595	815	905	950	980	**1000**

(A3) 3

Note: *Award (A1) for 165, (A1) for 1000, (A1) if all other entries are correct.*

(b)



(A5) 5

Notes: *Vertical axis and scale* *(A1)*
Horizontal axis and scale *(A1)*
Points *(A1)*
Curve (allow polygon) *(A2)*

(c) (i) Median = 46 (M1)(A1)

(ii) Scores < 35: 240 candidates (M1)(A2)

(iii) Top 15% $\Rightarrow$ Mark $\geq$ 63 (M1)(A1)(A1) 8

Notes: *Accept the answers from the* ***student's*** *graph.*
In each part, award (M1) for the dotted lines on the graph.

[16]

28. Mean = $\frac{(72\times1.79)+(28\times1.62)}{100}$ (M1)(M1)(M1)

= 1.7424 (= 1.74 to 3 sf) (A1) (C4)

[4]

29. (a) $m = \frac{300}{25}$ (M1)

$= 12$ (A1) (C2)

(b) $s = \sqrt{\left(\frac{625}{25}\right)}$ (M1)

$= 5$ (A1) (C2)

[4]